Subsocial Bees of the Genus Allodape Lep. & Serv.

by

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RESUMÉ

Bees of the genus *Allodape* are of extraordinary interest because of their unique breeding habits. The species belonging to this genus are numerous and widely spread in Africa but very little has so far been published about them. They nest in dry stems and often live in small communities, consisting of a few males and females with their brood. The females tend the young and feed them from day to day until they reach maturity. Thus they differ markedly from solitary bees and form a connecting link between them and the higher social bees. Three species found in the Cape Peninsula are dealt with in this paper — *Allodape angulata* Brauns, *A. abdominalis* Friese and *A. halictoides* sp. n., and an account is given of the annual cycle of activities, based on observations of the bees in artificial nests over a period of five years.

INTRODUCTION

Braruns (1926) was the first to call attention to the special interest attaching to the little bees of the genus *Allodape* Lep and Serv., that are so common and so widely spread in Africa. Prior to the publication of his paper, nothing was known about the habits of these bees and, as far as I am aware, no further information has been published since. He proved that they are unique among bees in their nesting habits and show the primitive beginnings of social life.

The different species of *Allodape* nearly all nest in dry stems and, by collecting these and splitting them open and examining the contents, Brauns showed that the bees often live in small communities, consisting of a few males and females, and that the females tend the young and feed them from day to day until they reach maturity. Thus they differ markedly from solitary bees and form a connecting link between them and the higher social bees.

There are many species of *Allodape* found in Africa (including the sub-genera *Allodapula* Cockerell and *Macrogalea* Cockerell) and there are a number that are still undescribed and unnamed. They are all small, the largest being only about half an inch long, mostly black, with yellow markings on the head. According to the system of classification adopted by Arnold (1947) they are included with the borer bees, *Ceratina* spp., in the tribe *Ceratinini* and placed next to the carpenter bees, *Xylocopini*, in the sub-family *Xylocopinae* of the family *Apidae*. Observations recorded below indicate that this classification is justified on the grounds of similarities in habits and life histories, quite apart from morphological characters.

Of the species of *Allodape* found in the Cape Peninsula three are fairly common on the mountain slopes at Hout Bay. These are *A. angulata* Brauns, *A. abdominalis* Friese and *A. halictoides* n.sp. They all nest in the dead, dry flower stalks of *Watsonia, Aristea, Osmitopsis* and other plants with pithy centres to the stems, and they suffer severely as a result of the frequent mountain fires because the dry stems burn readily and the bees and their young are destroyed. It is useless to hunt for these bees in areas that have recently been burned as it takes several years for them to recolonize such areas from outside. They are abundant in a protected area such as the National Botanic Gardens at Kirstenbosch.

ARTIFICIAL NESTS FOR ALLODAPE SPECIES

Stimulated by Brauns' observations I took up the study of these bees five years ago and endeavoured to establish them in glass tubes outside my laboratory on the lower slopes of Constantia Berg at Hout Bay. After some failures I succeeded and they are now nesting freely in the glass tubes outside my door. The tubes are six to twelve inches in length and they vary from three-sixteenths to three-eighths of an inch in internal diameter, these dimensions being suitable for the different species installed in them. To give the bees a foothold and to absorb any moisture that might condense on the inner surface of the tubes during wet weather, a strip of unglazed paper, about a quarter of an inch wide, is placed in each tube, lining the lower half of it (figure 5).

The rear end of each tube is plugged with pith and round the front end a few turns of adhesive tape, half an inch wide, are bound. The tape prevents the tube from slipping too far into the hole in the box container, affords an easy hold for drawing the tube in and out and prevents the exposed portion of the tube from heating too much in the sun. The end of the paper strip at the entrance to the tube must be fixed to the glass with a spot of gum, otherwise it is liable to buckle with changes in the humidity of the air and to block the entrance.

Each box container has wooden shelves on which the tubes rest and each is made to take four rows of tubes, eighteen in a row, two inches apart. The front of the box has holes bored in it just large enough for the tubes to slip easily in and out ; they must not fit too tightly as the wood swells when it is damp. The top of the box is covered with roofing felt to make it water-proof and the whole is painted green. To keep out ants, particularly the Argentine ant, *Iridomyrmex humilis* Mayr, which is such a serious nuisance at the Cape, the boxes are mounted on stands and adhesive tape bound round the supports and painted with a saturated solution of mercury bichloride in absolute alcohol.

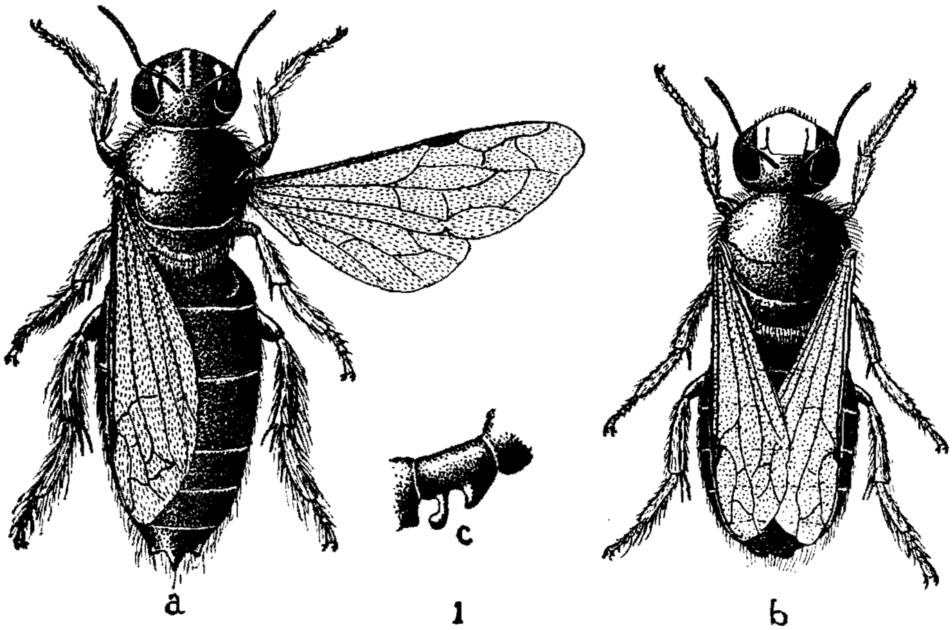
The best method of stocking the tubes, I found, was to collect the dry stems, in which the bees nest, at mid-summer, in the first half of January, and to remove the bees and their families and to place them in the tubes. At this time of the year the great majority of the young are in the pupal stage and they are easily transferred and the parents usually stay with them when they are put into their new homes. Some of the adults fly away and are lost but this is not serious as the pupae develop normally without them and the young bees that emerge from them stay in the tubes. If the dry stems containing the bees and their young are placed in the refrigerator for two or three hours the bees are reduced to a state of immobility by the cold and are easily handled ; they quickly recover when brought back to room temperature and seem to suffer no harm from a short exposure to a temperature of about — 5 degrees C. As these bees do not use any nesting material at all, everything that goes on inside the glass tubes is clearly visible and, once they are established, they require no care or attention ; the observer has only to inspect the tubes from time to time and to record his observations.

My tubes proved popular with various species of solitary bees that soon found them and made use of them. These included the primitive membrane bee, *Nothylacus heraldicus* Smith, the leafcutter bee, *Megachile venusta* Smith, and the carder bee, *Anthidium junodi* Friese. These intruders proved to be a nuisance at times as they occupied many of the tubes I required for *Allodape*.

MARKING THE BEES

In order to keep track of individual bees it is necessary to mark them in some way so that they can be recognised and this is not as easy as might at first appear. The most suitable medium for the purpose is cellulose paint, which is obtainable in various colours and put up in convenient small glass jars as " Model Airplane Dope ", obtainable from dealers in sports goods. Thinned to the right consistency with amyl acetate, it dries quickly and does not appear to harm the bees in any way and it stays on for a long time.

Before the bees can be marked they must be anaesthetised and I found that chloroform and ether are unsuitable for this purpose. It is difficult to regulate the dose and the insects are easily harmed or killed by an overdose. Carbon dioxide is less harmful. A simple and convenient method of applying the CO_2, if one has not the convenience of a chemical laboratory at hand, is by means of a soda-water siphon of the type used in homes for making soda-water with " sparklets ". The metal bulb containing the CO_2 is screwed into place on the empty siphon and the gas released ; then the glass tube containing the bees is held with its opening against the spout of



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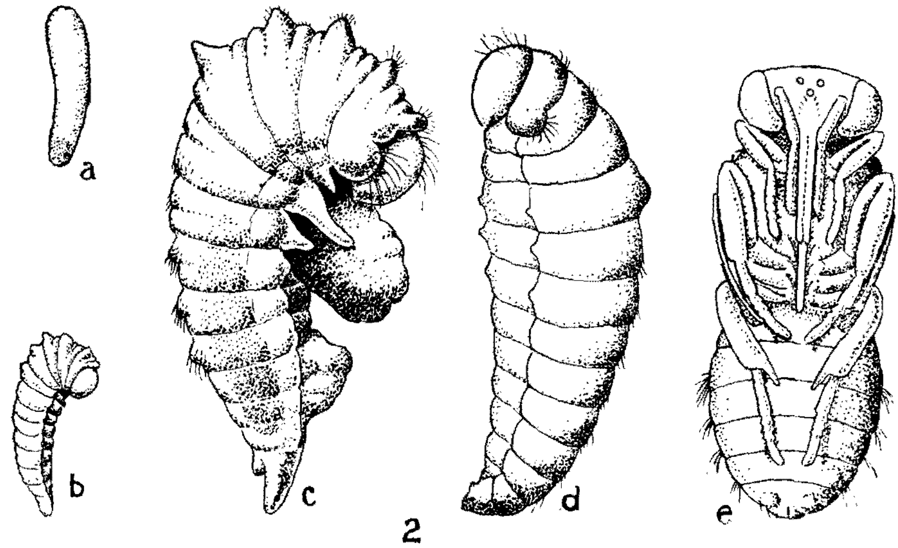

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the siphon and a little of the gas is squirted into the tube and the thumb placed over the opening. The anaesthetic acts quickly and the bees are rendered motionless long enough for them to be shaken out of the tube and marked with the paint. I found it was not necessary to replace the bees in their tubes. After being marked they were simply placed outside in the sun and they found their own way home when they recovered.

A still better method of handling the bees for marking, however, is by chilling them. If the glass tubes containing the bees are put into the refrigerator, inside the compartment for making ice-cubes, where the temperature is from −5 to −10 degrees Centigrade, and left there for about an hour, the bees are rendered motionless by the cold and can be handled and marked with ease. They suffer no harm and recover fully within a few minutes when restored to room temperature.

For applying the paint I find match-sticks, sharpened to a point, are better than brushes. A small dot of paint can be applied to the thorax with more precision than when the flexible point of a brush is used. The only satisfactory place for applying the marks is on the back of the thorax. If placed elsewhere on the body the bees can clean the spots off. There is room for one to four spots of paint on the thorax of a bee of the size of *A. angulata* and, by using four colours, white, yellow, red and blue, all of which show up well, a large number of different combinations can be made that serve to identify the individuals marked. Also a larger spot of one colour can have a smaller dot of another colour in the middle.

All the bees dealt with in this paper have the habit of somersaulting inside the tubes when they wish to change direction, therefore there is a good deal of rubbing against the wall of the tube. Also they are long-lived in the adult state and the paint spots, unless well applied, are liable to be worn off in time. Usually, however, enough of the cellulose paint adheres to serve to identify the bees throughout their life.

Allodape angulata Brauns.

This is one of the largest members of the genus, measuring 13 to 16 mm. in length. It is black, with the wings of a pale, smoky brown tinge. On the front of the head of the female there is a yellow line along the inner margin of each eye, broader in the lower part near the base of the mandibles and narrowed towards the apex. Usually, but not always, there is a median yellow line on the clypeus, but this may be partly or wholly absent. The clypeus of the male is entirely yellow, with a yellow triangular patch on each side between it and the eyes. In each sex there is a narrow yellow line running down the outer margin of each eye. The male has two

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Fig. 1.—*Allodape angulata* Brauns. a. — female; b. — male; c. — left hind trochanter of male.

Fig. 2—*Allodape angulata* Brauns. a. — egg; b. — young larva; c. — full-grown larva clasping mass of food; d. — larva in prepupal stage; e. — pupa, male.

prominent rounded protruberances on each trochanter of the hind legs (not five blunt teeth as stated by Brauns (1926) in his original description of the species; he must have confused the male of this species with that of another). The female is easily recognised by the three points at the tip of her abdomen (figure 1).

These bees are fairly common in the Cape Peninsula. They nest in the dead flower stalks of *Watsonia, Gladiolus, Aristea, Aloe* and other stems with pithy centres. They occur from sea level to the tops of the mountains at about 3,000 feet and may be found in the hollow stems at any time of the year. In making their homes the bees simply bite out and remove the pith to a depth of from three to six inches. Rarely, if ever, do they burrow through the hard wall of the stems, but they choose stems that have been broken and they burrow from the top.

The adults are surprisingly long-lived, the females living for about a year and the males for nine or ten months. In this they resemble the *Xylocopinae* (Skaife, 1952). The adults of the new generation emerge from the pupal state in mid-summer, from the end of December to the beginning of February, the majority of them coming out in January. They remain in the nest together as a small family party of some half a dozen males and females all through the remander of the summer and the winter, spending by far the greater part of their time in idleness inside their homes, only making occasional trips outside for food.

Breeding commences late in July or early in August, after a period of six or seven months spent in idleness. Prior to this some of the bees leave the nest and seek out new homes for themselves, leaving only two or three males and females behind in the original nest. In dealing with the annual cycle, it will be convenient to limit our attention to one female, let us say to a female that has left the parental home and established herself in a new nest. She begins by laying one large, white, oval, curved egg, 3 mm. long by 0.75 mm. wide, loose in the bottom of the tube. A few days later she lays another egg, and she continues laying at similar intervals until six or seven eggs have been deposited. I have never seen more than seven from one female and frequently the number is less. Often she will eat one of her eggs, replacing it with another laid a day or so later, therefore it is difficult to determine the exact time the eggs take to hatch. This egg-eating takes place usually during the spells of cold, wet weather that may occur at the Cape during August.

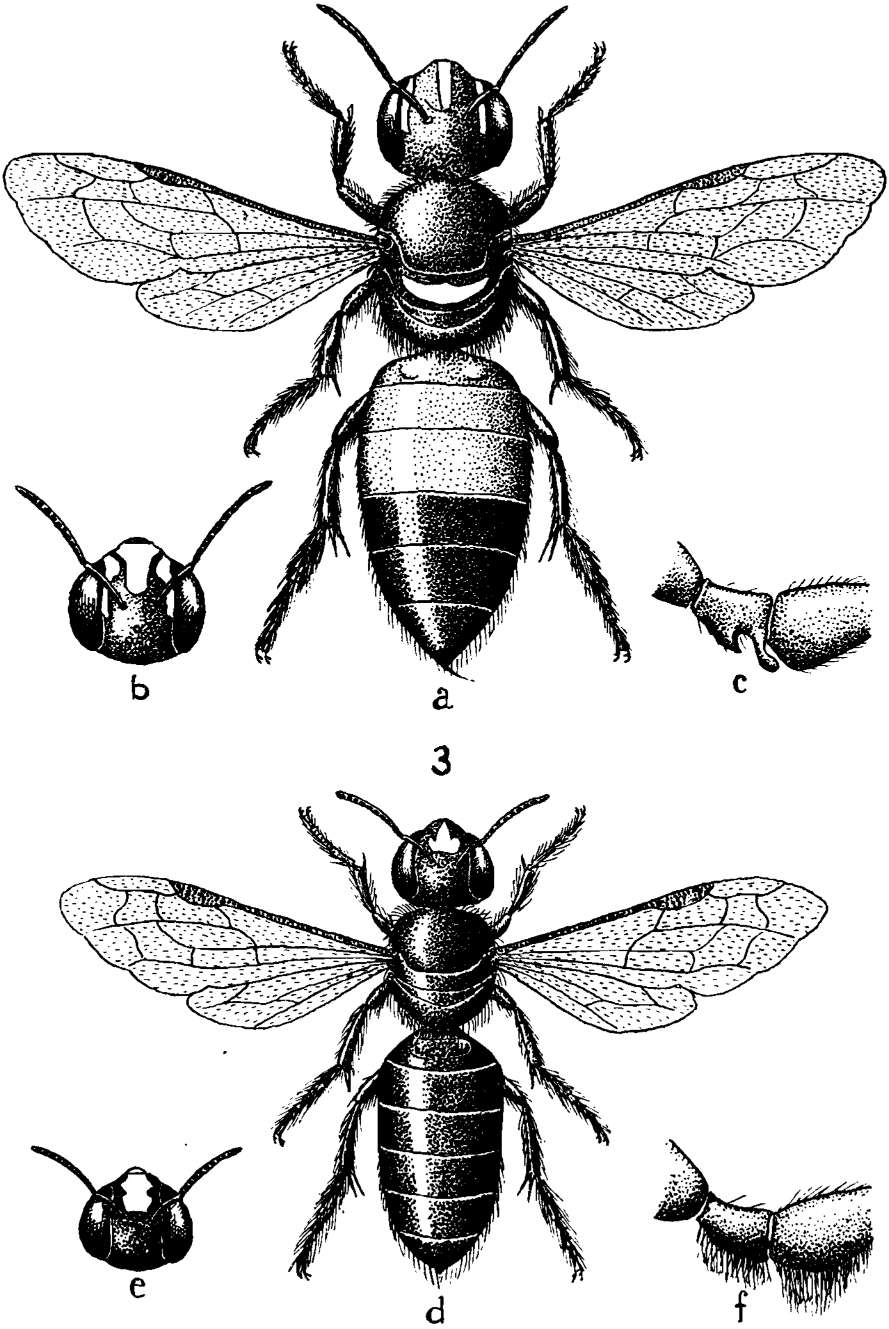
The eggs take from four to six weeks to hatch and all this time the mother remains on guard at the entrance to the tube, with her hind end outward, ready to sting any intruder. Her sting is so placed that it strikes upwards, at an angle, and she uses it readily if disturbed; it is quite painful, more so than that of the much larger carpenter bees, but not as bad as that of the honeybee. After the young have hatched the female leaves the tube more frequently, to forage for food, but even at this, the busiest period of her life, she only goes out two or three times a day and only stays away for twenty minutes or so on a trip. A curious feature of these bees is their habit of arranging their young in order of age and size, with the oldest larva nearest the entrance, followed by the next in age and so on down to the smallest larva and any unhatched eggs, which are always at the bottom of the tube. The larvae lie on their side, slightly curved, with the concavity towards the entrance, spaced at regular intervals along the tube, but if the tube is pulled out of the box and light admitted, the mother runs inside, pushing the oldest larva before her with the front of her head, until the larvae are all piled up near the bottom of the tube. Soon after the tube is replaced, however, she rearranges them in their neat order.

The newly-hatched young are fed by the mother on a colourless liquid food that she regurgitates on to the abdominal surface of the larva, where it clings as a clear drop just below its mouth. Thus the larva has only to bend its head slightly to reach the food and suck it up. After the larvae are a few days old she feeds them on a mixture of nectar and pollen. Returning to the nest with her hind legs laden with pollen and her crop full of nectar, she first of all scrapes off the pollen into a small heap on the floor of the tube. Then, standing over this heap, she regurgitates a drop of nectar and mixes it with the pollen to form a stiff paste, using her mandibles for the purpose. Picking up the sticky mass between the base of her tongue and the base of her mandibles, she walks along the tube to the larva that has to be fed and thrusts it between the pseudopodia (figure 2c). The larva grasps the food between its pseudopodia and at once begins to feed. The younger larvae, fed on liquid food, do not have these pseudopodia — they only develop when the larva is about one third grown. The mother does not attempt to store any food in the nest; she brings it from day to day as it is required, and during spells of inclement weather the larvae have to go hungry. I find that they can starve for four or five weeks without coming to any harm.

When a larva is about half grown it begins to pass excrement, resembling the larvae of carpenter bees, Xylocopinae, in this respect. The mother removes the yellow pellets from the nest as they are excreted by the young. In seven or eight weeks, during November, the first larvae to hatch are fully grown and, after a rest of about sixteen days, they pupate. There is no cocoon and the pupae lie loose in the tube, like all the other stages. When all the larvae have pupated, by about the middle of December, the mother arranges them in a row along the tube, head to tail, and she once more spends nearly all her time resting at the entrance, to guard against intruders. After five weeks in the pupal state the adults emerge, mostly during January.

Just before or just at the time when her progeny reach maturity, the old mother, now about a year old, may begin to lay again and she may lay three or four eggs, never more and often less. She lingers on for some days or even for two or three weeks after her sons and daughters have emerged, easily recognised by the frayed tips to her wings, but sooner or later she disappears. By the end of January all the old females have gone from my tubes.

The larvae that hatch from the last eggs laid by the old female are reared by her daughters from February to April. Thus, when the nests



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are opened in the field there is what appears to be a partial second generation in the late summer and autumn, but this is not so. These late larvae and pupae are the second instalment of the only generation during the year; they are the progeny of the old females that laid a few more eggs just before they died and they are reared by their sisters. The male bees in the tube go out from time to time to get food for themselves but they never attempt to assist in the feeding of the young.

Often females disappear from my tubes in the course of the year, leaving a starving family behind them, and I assume that these females fall victims to such enemies as crab spiders and bee-hunting wasps (Philanthidae). I find that, if I transfer the starving larvae of dead mothers to the nests of other females they are often accepted and reared with the bee's own progeny, but sometimes they are rejected and thrown out of the nest. I also find that it is fairly easy to rear these motherless larvae by hand, feeding them on the mixture of honey and pollen taken from a *Xylocopa* or *Ceratina* nest.

The half a dozen or so young bees in the nest, after the old mother has disappeared, usually consist of half males and half females, but the proportion varies widely. They generally remain together as a family party, spending by far the greater part of their time crowded together inside the nest. Some of them may change their abode, the males doing this more frequently than the females. By the time the second instalment emerge late in March and in April, the nest gets overcrowded and most of the adults that came out earlier in the year leave the parental home and seek out nesting places for themselves. As a rule, only three or four individuals remain in the old nest.

I gave my bees wider and longer tubes, up to half an inch in diameter and twelve inches in length, in the hope that these roomy nests would induce them to remain together and form larger colonies than are found in nature. But this did not happen. No matter how roomy the tube, only three or four at most remain together; the rest always scatter. Also the bees do not like the bigger tubes. They prefer tubes about six inches long and a quarter of an inch internal diameter, as was clearly shown by the way in which females took up their abode in tubes of this size, in preference to all others.

During five years investigation, I have only come across two parasites attacking these bees. The one is a small black chalcid, unidentified but belonging to the Encyrtidae, about 1.5 mm. in length. This parasite appears to be polyembryonic as a large number of adults, all of the same sex, issue from one parasitized larva of *A. angulata*. The host larva reaches nearly

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Fig. 3.—*Allodape abdominalis* Friese. a. — female; b. — head of male; c. — right hind trochanter of male.
Allodape halictoides n. sp. d. — female; e. — head of male; f. — right hind trochanter of male.

full size before it is killed by the parasites, which pupate inside its hollowed-out and bloated skin. Strangely enough, the mother bee does not throw out the dead, parasitized larva but watches over it until the parasites emerge and make their way out of the tube. Out of hundreds of larvae reared in my tubes I have only come across three or four infested with these tiny parasites. The other parasite is a bronze-coloured chalcid, about 4 mm. long, a member of the Eulophidae. I only came across it once, feeding as an ectoparasite on a full-grown larva and I reared twelve adults from this one specimen. I have not found the parasitic bee, *Eucondylops konowi* Brauns, at Hout Bay.

Allodape abdominalis Friese.

This handsome species is not as common as *A. angulata*. It is 9 to 11 mm. in length, with black head, thorax and hind half of the abdomen, and bright red on the first three segments of the abdomen. There is a conspicuous yellow, crescent-shaped mark on the scutellum. On the front of the head of the female there are three narrow yellow stripes, with a yellow stripe along the outer margin of each eye. The pubescence on the body and legs is yellowish-brown. The male is similar in colour and markings to the female, except that the whole of his clypeus is yellow. His hind trochanters are each armed with a stout tooth and a prominent, rounded protruberance, similar to those found in the male of *angulata* (figure 3).

This species is also very close to *angulata* in its habits and breeding cycle. It nests in dead, hollow stems and the female starts laying in August. She lays four or five comparatively large, sausage-shaped eggs, 2 mm. in length, and these lie loosely at the bottom of the tube. When they hatch the young are tended in the same way as described above for *angulata*. Well developed pseudopodia are found on the thorax of the older larvae. They reach full size in December and the adults of the new generation emerge during January and the first half of February. There is only one generation a year. The young adults remain together in the nest as a small family party for a time but later some of them leave to seek new homes for themselves. Not more than two or three females remain together when breeding starts and these may, or may not be accompanied by two or three males. The adults live for about a year.

Allodape halictoides sp. n.

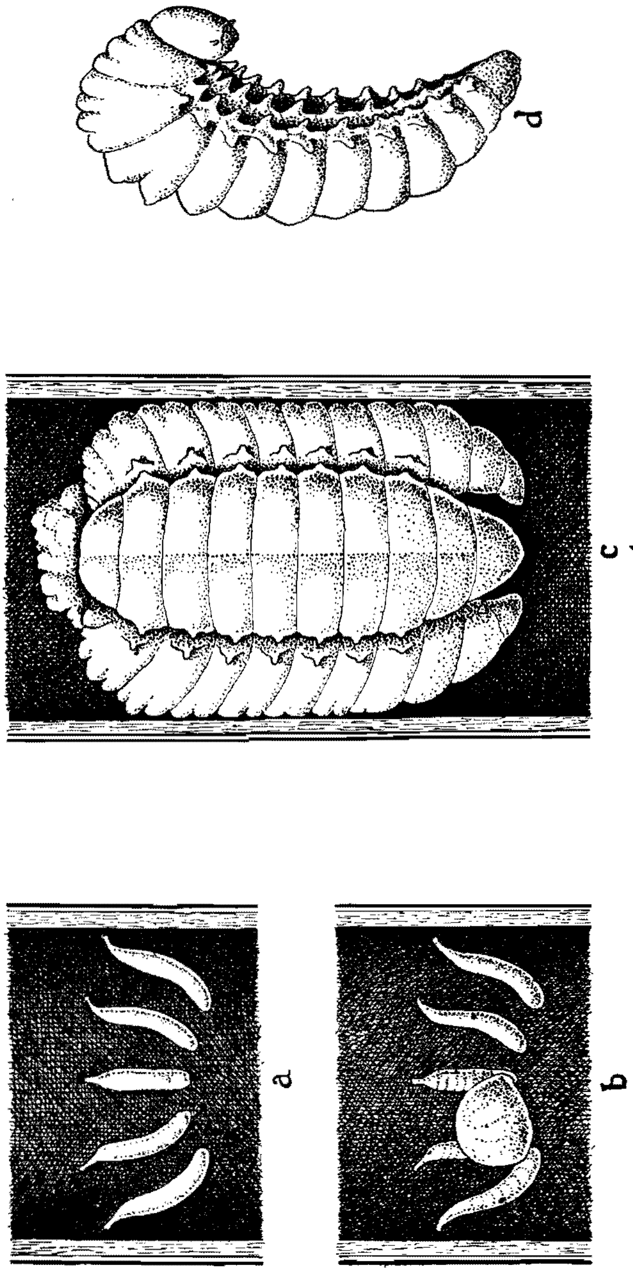
I have adopted the name *halictoides* from the manuscript of the late Dr. H. Brauns. He intended to monograph this group but the work was incomplete at the time of his death and it has not so far been published. His manuscript is lodged in the Transvaal Museum and it is to be hoped that it will be taken up and completed by a hymenopterist in the not-too-distant future.

This species is black, 7 to 8 mm. in length, with a small round yellow spot on each side of the thorax, just below the tegula, that is very characteristic. There is a triangular yellow mark on the clypeus of the female, with a rounded lobe on each side, whilst the male has a broad yellow band on the clypeus, slightly indented on each side. The hind trochanters of the male have each a dense tuft of whitish hairs on them, with another tuft of longer whitish hairs on the underside of the femur (figure 3). There is no trace of any teeth such as are found on the trochanters of males of such species as *angulata* and *abdominalis.* The pubescence on the thorax and abdomen is sparse, yellow or whitish, whilst on the tarsi of the front and middle legs and on the tibiae and tarsi of the hind legs it is denser and golden yellow in colour. The wings are hyaline with the stigma prominent and well marked. The tip of the abdomen of the female is pointed and upturned so that the sting, when thrust out, strikes upwards. The tip of the abdomen of the male is bluntly rounded and more densely pubescent than the rest of the body. This species should be easily recognised by the yellow spots on the sides of the thorax and by the shape of the mark on the clypeus. It is common in the Cape Peninsula.

This species differs markedly from the other two dealt with in this paper, not only in such morphological characters as the male trochanters and genitalia, but also in certain aspects of its life history. Usually larger numbers of adults may be found living together in a dry stem than is the case with *angulata* and *abdominalis,* and I have frequently found ten or a dozen individuals together in a nest; fourteen was the largest number I have had at any one time in any of my tubes. These are, however, mostly young males and females that have not yet started to breed, as there is only enough room in a nest for two females at most to rear their young at the same time.

A female that has emerged from the pupal state late in January or during February will rest all through the autumn, only taking occasional flights from the nest for food, until about the middle of July, when she will commence to lay eggs. Her eggs are oval, white and about 1.3 mm. long, and they are not dropped loosely in the tubes, as is the case with the other species, but they are fixed round the inner wall at regular intervals, all at the same level and jutting out towards the centre something like the spokes of a wheel (figure 4a). If she is alone she may lay eight or nine eggs, whilst two females working together may lay a dozen or thirteen, but there is no room for any more round the inner circumference of the tube. Frequently a female will eat one or more of her eggs and replace them with others laid later. Some females start laying much later than others and eggs may be found in the nests from the middle of July up to the end of September.

Owing to the cold winter weather the eggs take five or six weeks to hatch at this time of the year. The newly hatched larvae remain fixed to the wall of the tube, attached by the hind end of the chorion, all with their heads projecting towards the centre at the same level in the tube, therefore the female can feed a number of them together by simply depositing the food in the region of their mouths (figure 4b). The larvae remain in this position, radiating from the wall of the tube, for some days and they are fed on clear, liquid food which apparently consists of nectar mixed with salivary secretions. As they grow bigger they come to lie side by side,



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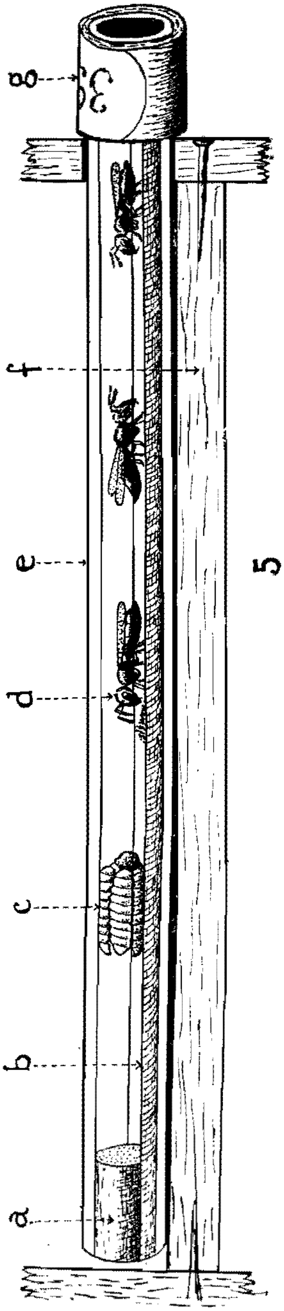

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all with their heads pointing towards the entrance of the tube and all at the same level. The female now feeds them on a mixture of nectar and pollen pushed in between their heads, so that they all feed on the one common food-mass (figure 4c). The pollen, carried home on her hind legs, is scraped off in a heap just in front of the larvae and quite a store may be accumulated on the floor of the tube during favourable weather. When she feeds the larvae she simply regurgitates a little nectar on to the heap of pollen, mixes it with her mandibles and then picks up the sticky mass and thrusts it betwene the hungry mouths. This labour-saving arrangement makes her work light and easy so that, even when she is rearing her family, she can spend the greater part of her time idling in the nest.

Instead of the well-developed pseudopodia on the thorax that characterize the larvae of *angulata* and *abdominalis,* the larvae of this species have four rows of small, fleshy protruberances along the ventral surface and these serve to hold them together when they are packed like sardines in the tube (figure 4d). Even in a roomy nest there is only enough space for ten to twelve larvae to lie side by side, and that is why no more than two females can nest together in the same tube. The well-grown larvae completely block the tube, therefore there cannot be more than one layer of them, for any larvae behind would be starved because the females could not get at them.

The larvae do not pass any excrement whilst they are feeding and growing — another striking difference between this species and the others dealt with in this paper. They are fully grown in seven to eight weeks and the females then pull them apart and arrange them in a row along the tube. This usually occurs some time in October and the larvae, after resting for a fortnight, cleanse themselves by emptying the alimentary canal and the excrement is removed from the nest by the females. The larvae, now pure white and slightly smaller than before, rest in the prepupal state for another ten days or so and then they pupate. The pupal stage lasts for three or four weeks and the adults of the new generation emerge towards the end of November and during December.

Like the other two species, some of the old females may lay a few more eggs just before they die and the young from this second instalment may be found in the nest at the end of December and during January. Development is quicker at this time of the year than it is for the young hatched in the early spring. The eggs take a fortnight to hatch and the larvae are fully grown in about fifteen days and the pupal stage lasts only two

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Fig. 4. — ***Allodape halictoides*** **n. sp. a. — eggs fastened round inner wall of nest; b. — three of the eggs have hatched and the young larvae have been supplied with food; c. — full-grown larvae packed side by side in nest; d. — full-grown larva.**

Fig. 5. — **Glass tube containing** ***Allodape halictoides*** **n. sp. a. — pith plug; b. — strip of unglazed paper; c. — larvae; d. — female with pollen mass; e. — glass tube; f. — shelf in box on which tube rests; g. — adhesive tape round mouth of tube, which protrudes in open air.**

or three weeks. Thus these late adults emerge during February and March. From this time onwards, until the middle of July, only adults are to be found in the nests; immature stages are absent at this time of the year. Just before breeding commences in July, most of the females leave the parental home to seek out new nesting places for themselves.

SIMILARITY BETWEEN ALLODAPE AND XYLOCOPA

There are points of resemblance in the life cycle of *Allodape* spp. and *Xylocopa* spp. that indicate a close relationship between these bees. In the first place, the adults, both males and females, are long-lived and the larval stage is comparatively short. With the majority of solitary bees it is just the reverse. For example, the leafcutter bee, *Megachile venusta* Smith, that nests freely in my tubes, lives only a few weeks as an adult but spends some nine or ten months as a resting larva in the prepupal stage. Thus the long diapause occurs with this species prior to pupation, whilst in the case of *Allodape* and *Xylocopa* it occurs in the adult state, prior to oviposition. This longevity of the adults is essential before any form of social life can evolve: short-lived adults that never see their offspring, such as *Megachile, Anthidium* and others, can never become social insects.

Carpenter bees, like the bees dealt with in this paper, live together in family parties for months before breeding commences. Occasionally two female carpenter bees may remain together and co-operate in their nesting (Skaife, 1952); it is quite usual for two or more female *Allodape* to share the same nest and assist one another in rearing their families. Sometimes a female carpenter bee will lay one or two more eggs after her first batch of young have reached the adult stage: this often occurs in the case of *Allodape* females. The females of both groups lay a·few, comparatively large eggs. The larvae do not spin cocoons; the pupae are quite naked. In brief, the principal difference between *Allodape* and *Xylocopa* is to be found in the fact that the latter divide their nests into cells by means of partitions, whereas the former do not.

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